

R e m a r k s

Claims 2-10, 12-14, 19-23, 25, 26, 28 and 29 are pending in the application.

Claims 31-32 are rejected under 35 U.S.C. 112, ¶1.

Claims 2-3, 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US Patent #6,650,846, hereinafter Ito) in view of Miyamoto et al. (US Patent #7,116,917, hereinafter Miyamoto).

Claims 5-8, 9, 12-14, 19-20, 25, 26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Van Der Tol (US Patent #5,708,734, hereinafter Van Der Tol).

Claims 21, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Van Der Tol and further in view of Yao (US Patent #5,654,818, hereinafter Yao).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Fujiwara et al. (US PGPub 2003/0161638).

Each of the various rejections and objections are overcome by amendments that are made to the specification, drawing, and/or claims, as well as, or in the alternative, by various arguments that are presented.

Entry of this Amendment is proper under 37 CFR 1.116 since the amendment: (a) places the application in condition for allowance for the reasons discussed herein; (b) does not raise any new issue requiring further search and/or consideration since the amendments amplify issues previously discussed throughout prosecution; (c) satisfies a requirement of form asserted in the previous Office Action; (d) does not present any additional claims without canceling a corresponding number of finally rejected claims; or (e) places the application in better form for appeal, should an appeal be necessary. The amendment is necessary and was not earlier presented because it is made in response to arguments raised in the final rejection. Entry of the amendment is thus respectfully requested. Any amendments to any claim for reasons other than as expressly recited herein as being for the purpose of distinguishing such claim from known prior art are not being made with an intent to change in any way the literal scope of such claims or the range of equivalents for such claims. They are being made simply to present language

that is better in conformance with the form requirements of Title 35 of the United States Code or is simply clearer and easier to understand than the originally presented language. Any amendments to any claim expressly made in order to distinguish such claim from known prior art are being made only with an intent to change the literal scope of such claim in the most minimal way, i.e., to just avoid the prior art in a way that leaves the claim novel and not obvious in view of the cited prior art, and no equivalent of any subject matter remaining in the claim is intended to be surrendered.

Also, since a dependent claim inherently includes the recitations of the claim or chain of claims from which it depends, it is submitted that the scope and content of any dependent claims that have been herein rewritten in independent form is exactly the same as the scope and content of those claims prior to having been rewritten in independent form. That is, although by convention such rewritten claims are labeled herein as having been "amended," it is submitted that only the format, and not the content, of these claims has been changed. This is true whether a dependent claim has been rewritten to expressly include the limitations of those claims on which it formerly depended or whether an independent claim has been rewritten to include the limitations of claims that previously depended from it. Thus, by such rewriting no equivalent of any subject matter of the original dependent claim is intended to be surrendered. If the Examiner is of a different view, he is respectfully requested to so indicate.

Rejection Under 35 U.S.C. 112, ¶1

Claims 31-32 are rejected under 35 U.S.C. 112, ¶1, as failing to comply with the written description requirement. The rejection is traversed.

The Office Action asserts that there is insufficient support in the disclosure for "non-adjacent bits" as described in claims 31-32 (Office Action p. 2). Applicants respectfully disagree. The Summary of the Invention as part of the original Specification states at p. 3 lines 6-8 "differential phase shift keying between two optical bits separated by an even number of bit periods," at lines 13-16 "the signal is carried as phase shift keying between two optical bits separated by an even number of bit periods," and at lines 22-25 "optical data encoding as phase shift keying between the two optical bits separated by an even number of bit periods" (Cross-ref. Pub. US 2005/0185968 A1, par. 9-11). In

addition, the Detailed Description as part of the original Specification states at p. 5 lines 2-5 “Although the present invention is discussed below with reference to two-bit delay implementations of APol-DPSK, it can be understood by those skilled in the art that straightforward modifications allow implementing APol-DPSK for other even-bit delay cases” (Cross-ref. Pub. US 2005/0185968 A1, par. 22-23). Bits separated by an “even bit delay” or “two-bit delay” and “optical bits separated by an even number of bit periods” are clearly “non-adjacent.” Thus, although the exact terminology is not used in the Specification, it is inherent in the disclosure that the subject bits are “non-adjacent.”

Nevertheless, in the interest of furthering the application process, claim 31 is amended to incorporate the feature of claim 32 “wherein the non-adjacent bits are separated by an even number of bit periods.” The feature is copied verbatim from the original Specification p. 3 lines 6-8 and 13-16. Applicants therefore submit that claim 31 is fully supported by the scope of the disclosure. At least for this reason the rejection under 35 U.S.C. §112 is not proper and the Examiner is respectfully requested to withdraw the rejection.

Rejections Under 35 U.S.C. 103(a)

Claims 2-3, 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto. Claims 5-8, 9, 12-14, 19-20, 25, 26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Van Der Tol. Claims 21, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Van Der Tol and further in view of Yao. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and further in view of Fujiwara. The rejection is respectfully traversed.

The Examiner bears the initial burden of establishing a *prima facie* case of obviousness. See MPEP § 2141. Establishing a *prima facie* case of obviousness begins with first resolving the factual inquiries of *Graham v. John Deere Co.*, 383 U.S. 1 (1966). The factual inquiries are as follows:

- (A) determining the scope and content of the prior art;
- (B) ascertaining the differences between the claimed invention and the prior art;

- (C) resolving the level of ordinary skill in the art; and
- (D) considering any objective indicia of nonobviousness.

Once the *Graham* factual inquiries are resolved, the Examiner must determine whether the claimed invention would have been obvious to one of ordinary skill in the art. The key to supporting a rejection under 35 U.S.C. §103 is the clear articulation of the reasons why the claimed invention would have been obvious. The analysis supporting such a rejection must be explicit. "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F. 3d 977, 988 (Fed.Cir. 2006), *cited with approval by KSR Int'l Co. v. Teleflex, Inc.*, 126 S. Ct. 2965 (2006); *see also* MPEP §2141.

Claims 2-3, 10 and 29

Claims 2-3, 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto. With respect to independent claim 10, the Office Action fails to establish a *prima facie* case of obviousness, because Ito and Miyamoto, alone or in combination, fail to teach or suggest all the claim elements. In particular Ito and Miyamoto do not teach or suggest the claim feature "differential phase shift keying between two optical bits separated by an even number of bit periods."

The Office Action asserts that while this claim feature is not found in Ito, such deficiency is satisfied by the secondary reference Miyamoto. It is maintained that the two-bit delay of phase modulator (3) of Miyamoto Fig. 17 is equivalent to this feature (Office Action p. 4 *citing* Miyamoto col. 11 lines 16-18, col. 16 lines 39-50). Respectfully, this is not accurate.

In the passages of Miyamoto referenced by the Office Action, Miyamoto discloses a "delay of the pre-coding unit 2 [of]...two time slots" shown in Miyamoto Fig. 17 (*see* Miyamoto, col. 16, line 34-49). The two-bit delay is applied uniformly and sequentially to all bits in the data stream. In addition, the output of the precoder (2) is an intensity modulated signal, not a phase modulated signal as in Applicants' method. This is clearly shown in Miyamoto Figs. 18 A-B showing intensity modulation as compared to Figs. 18 C-G which show phase modulated signals. It should be pointed out that there is

a two-bit delay phase modulated signal output from the interferometer (5) in Miyamoto Fig. 17. However, it is also unmistakable that the two bit delay is applied to all bits uniformly and sequentially: the “2 BIT DELAY OPTICAL SIGNAL” of Fig. 18E is merely a time shifted version of the “MZ MODULATOR OPTICAL OUTPUT” of Fig. 18D.

Applicants’ method is vastly different and operates with an entirely novel format of signal transmission. In Applicants’ method of claim 10, according to a representative embodiment, the bits between which DPSK takes place are “separated by an even number of bit periods” so that the APol-DPSK encoding will be performed on bits “having the same polarization” with respect to how they will be transmitted (*see* Specification, page 5, line 15). For example, according to a representative embodiment, bits of the original data stream are separated into two sequences [1, 3, 5, 7...] and [2, 4, 6, 8...]. Bits in the first group are given a common polarization, bits in the other group are given an orthogonal polarization. Thus “successive optical bits [i.e. 1-2, 2-3, etc.] have substantially orthogonal polarizations.” The DPSK logic comparison is applied to the even bit sequence and separately to the odd bit sequence. Comparing to Miyamoto, it is clear that the Miyamoto system does not teach or suggest this feature.

At least for the above reasons, Applicants’ independent claim 10 is allowable over the cited references under 35 U.S.C. 103.

In addition, the primary reference Ito is not pertinent prior art as it is devoid of any reference to differential phase shift keying (DPSK) which is integral to Applicants’ method. Ito contains a phase modulator for sinusoidal phase modulation of a signal wherein the data is intensity-modulated (Ito col. 10 lines 19-24). Clearly the phase modulator is not PSK or DPSK encoding the data because the purpose of phase modulation in Ito is to “provide an optical transmitter and an optical transmission system that can sufficiently suppress waveform degradation caused by SPM-GVD effect” (Ito Summary of the Invention col. 2 lines 6-9). The phase modulator in Ito supports this goal by providing an optimal depth of pre-chirp (*see* Ito col. 6 19-24 and 30-32 “the superposition of the bit-synchronized phase modulation (pre-chirp) restrains the degradation of the waveform caused by the SPM-GVD effect”).

The Office Action suggests that “[i]t would be obvious for a person of ordinary skill to understand that the phase modulator...in Ito can be arranged to perform PSK or DPSK modulation” (Office Action p. 4). However, if one were to make this hypothetical modification to Ito, the system would no longer function for its intended purpose of “surpress[ing] waveform degradation caused by SPM-GVD effect.” The phase modulation is required for providing the pre-chirp and it therefore cannot be used at the same time for data encoding. In such circumstances, the citation of Ito as a reference under 35 U.S.C. § 103 is improper (see MPEP 2143.01(V): “If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation”). For at least this reason the Office Action fails to establish a *prima facie* case of obviousness and the rejection should be withdrawn.

Since dependent claims 2-3 depend from independent claim 10 and include all the same limitations, and as the references cited against claim 10 have been overcome as described hereinabove, each such dependent claim is also allowable over Ito in view of Miyamoto under 35 U.S.C. 103.

Independent claim 29 is rejected under 35 U.S.C. §103(a) over Ito in view of Miyamoto. Independent claim 29 recites similar relevant limitations to those recited in independent claim 10. As such, for at least the same reasons discussed above, independent claim 29 also is allowable over Ito in view of Miyamoto under 35 U.S.C. 103(a).

Therefore, Applicants respectfully request that the rejection of claims 2-3, 10 and 29 be withdrawn.

Claims 9, 5-8, 12-14, 25, 19-20, 26, and 28

Independent claims 9, 12, 25, 26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and in further view of Van Der Tol. The rejection is traversed.

Each of the independent claims 9, 12, 25, 26, and 28 recite similar relevant limitations to those found in independent claim 10. However, Van Der Tol is cited as an

additional reference against such independent claims since the Office Action acknowledges that Ito and Miyamoto do not teach or suggest certain claim features.

Since Ito and Miyamoto have been overcome as references regarding claim 10, as described hereinabove, and because independent claims 9, 12, 25, 26, and 28 recite similar relevant limitations and there is no argument put forth by the Office Action that Van Der Tol supplies that which is missing from Ito and Miyamoto to render independent claim 10 unpatentable, this ground of rejection as to independent claims 9, 12, 25, 26 and 28 likewise cannot be maintained.

As such, claims 9, 12, 25, 26 and 28 are patentable under 35 U.S.C. 103(a) over Ito in view of Miyamoto and in further view of Van Der Tol. The Examiner is respectfully requested to withdraw the rejection.

Claims 5-8, 13-14, and 19-20

Dependent claims 5-8, 13-14, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and in further view of Van Der Tol. The rejection is traversed.

This ground of rejection applies only to dependent claims and is predicated on the validity of the rejection under 35 U.S.C. 103 given over Ito in view of Miyamoto and in further view of Van Der Tol. Since each such dependent claim includes all the relevant limitation of the respective independent claims from which they ultimately depend, and since such rejections of the independent claims have been overcome, as described hereinabove, the rejection of the dependent claims likewise cannot be maintained.

As such, claims 5-8, 13-14, and 19-20 are patentable under 35 U.S.C. 103(a) over Ito in view of Miyamoto and in further view of Van Der Tol. The Examiner is respectfully requested to withdraw the rejection.

Claims 21-23

Dependent 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto, in further view of Van Der Tol, and in further view of Yao. The rejection is traversed.

This ground of rejection applies only to dependent claims and is predicated on the validity of the rejection under 35 U.S.C. 103 given claim 25 over Ito in view of Miyamoto and in further view of Van Der Tol. Since the rejection under 35 U.S.C. 103(a) of independent claim 25 has been overcome, as described hereinabove, and there is no argument put forth by the Office Action that Yao supplies that which is missing from Ito, Miyamoto, and Van Der Tol to render independent claim 25 obvious, the rejection of dependent claims 21-23 likewise cannot be maintained.

As such, claims 21-23 are patentable under 35 U.S.C. 103(a) over Ito in view of Miyamoto, in further view of Van Der Tol, and in further view of Yao. The Examiner is respectfully requested to withdraw the rejection.

Claim 4

Dependent claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Miyamoto and in further view of Fujiwara. The rejection is traversed.

This ground of rejection applies only to a dependent claim and is predicated on the validity of the rejection under 35 U.S.C. 103 given independent claim 10 over Ito in view of Miyamoto. Since the rejection under 35 U.S.C. 103(a) of independent claim 10 has been overcome, as described hereinabove, and there is no argument put forth by the Office Action that Fujiwara supplies that which is missing from Ito and Miyamoto to render independent claim 10 obvious, the rejection of dependent claim 4 likewise cannot be maintained.

As such, claim 4 is patentable under 35 U.S.C. 103(a) over Ito in view of Miyamoto and in further view of Fujiwara. The Examiner is respectfully requested to withdraw the rejection.

Conclusion

It is respectfully submitted that the Office Action's rejections have been overcome and that this application is now in condition for allowance. Reconsideration and allowance are, therefore, respectfully solicited.

If, however, the Examiner still believes that there are unresolved issues, the Examiner is invited to call Eamon Wall at (732) 530-9404 so that arrangements may be made to discuss and resolve any such issues.

Respectfully submitted,

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